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**CODED DIRECT AND REMOTE IGNITION STARTER FOR
AUTOMOBILES**

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PRIORITY DATE

No. OF CLAIMS 5

ABSTRACT OF THE DISCLOSURE

The disclosure sets forth a starting ignition system for automobiles which is adapted to protect the automobile against theft and enables the identification of stolen automobiles. A discrete actuator for each automobile is adapted to be processed by a licensing authority. The system requires a separate electrical terminal for each of the services in the automobile and the control of power to such terminals is achieved by control circuits contained within the housing enclosing a battery control circuit, an ignition control circuit and a starting control circuit.

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This invention relates to an anti-theft direct and remote starting system for automobiles.

10 An ignition key is used universally for actuating the ignition circuit of an automobile. The automobile is so wired that the ignition circuit may be by-passed by a thief. While automobile serial number markers and engine serial numbers may be recorded in a bill of sale or automobile registration for licensing purposes, it is virtually impossible to discover whether a secondhand automobile has been reworked or parts interchanged to assist in the recovery of stolen property.

20 Remote starting systems for automobiles, especially of the radio transceiver type are all characterised in the prior art by a radio signal actuated device which effectively shunts the ignition switch. Various radio transmitters and transceiver systems have been proposed for remote starting of automobile engines by causing a discrete code to be sent, which code is different for each automobile as is represented by United States Patent to Bean et al, No. 3, 530, 846. Some prior remote starting systems embody highly developed controls automatically governing engine operation during the early stages of starting procedure and for a period of minutes thereafter shown, for example, in United States Patent to Baratelli et al, No. 3, 577, 164. Some remote starting systems provide for indication of engine condition information to the remote operator as found, for example, in Hawthorne No. 3, 455, 403.

According to the present invention the ignition key of an automobile is recognised as a code actuator consisting of an access or carrier code, i. e. the shape of the key permitting it to be inserted into the lock and an actuating or ignition code consisting of the key teeth

The manual manipulation of the key to close a starting switch is not coded in the ordinary automobile but may be regarded as a starting code or operation. Further, according to the invention, the code actuator may be in any one of a number of physical forms and preferably in the form of a code card having a carrier code thereon and an ignition code thereon and adapted to be physically movable to close a switch generating a starting signal. In this sense therefore the code card of the concept of the invention embraces improved operative aspects of the ordinary ignition key. The code card may carry its codes in the form of magnetic information apertures, notches depressions or raised portions representing a unique code for each automobile. The code card is used to actuate a remote transmitter. The insertion of the card generates a carrier, a code of the card is converted to a discrete code modulating the carrier and a starting signal may be sent by depressing the card in the small portable transmitter.

Of particular importance to the invention, however, is the use of the transmitter within the automobile itself to be inserted in the transmitter in association with a code receiver similar to the insertion of a recording tape in a so-called hi-fi tape reproducing system of the type installed in automobiles. In other words, the transmitter cartridge when plugged into the automobile receiver enables the ignition circuits to be actuated by utilising the code card in the transmitter when the latter is in place in the automobile. Thus the operator may remove the small package transmitter with the code card or may merely remove the code card. By reason of this aspect of the concept of the invention it will be realised that a substantial departure from the prior art is afforded by way of causing the code

receiver according to the invention to include control circuitry for various automobile functions including the battery circuit itself so that all services of the automobile must be separately connected to the various control terminals emerging from the receiver described hereinafter whereby theft of the automobile is rendered particularly difficult because there is no direct ignition circuit to be by-passed and such rearrangement of circuitry of automobile wiring constitutes another object of the invention.

10 Furthermore the invention by way of its objects relating to the use of a code actuator operative transmitter removably associated with an ignition code receiver in an automobile enables the code actuator when provided in code card form to be processable by automobile license registration computer facilities whereby the renewal of an automobile license necessarily requires the proofing of the renewal by processing of the ignition code card against the registered ownership thereby serving as a direct means of detecting an unauthorised transfer of ownership.

20 It is a still further object of the invention by the utilisation thereof to substantially entirely eliminate the marketing of stolen automobiles beyond the period of registration for licensing of same.

Other objects of the invention will be apparent from a study of the following specification taken in conjunction with the accompanying drawings.

IN THE DRAWINGS

Figure 1 is an on-edge perspective view of a transmitter and code card of one form preferred according to the invention.

Figure 2 is an on-edge perspective of an ignition receiver according to

the invention showing the transmitter associated therewith in chain lines.

Figure 3 is a view of an automobile dash-panel revealing a typical installation of a radio and ignition receiver and transmitter according to the invention.

Figure 4 is a diagrammatic view of operative parts of the transmitter associated with the code card for providing a carrier code, an ignition code and a starting signal.

Figure 5 is a circuit schematic of a portable transmitter unit according to the invention.

Figure 6 is an electrical circuit block diagrammatic schematic of a preferred form of ignition receiver according to the invention.

According to one mode of the invention an ignition code actuator in the form of a code card 10 comprises a rectangular shaped rigid sheet material as, for example, polyvinyl chloride and carrying a readable code number 11 which may be related to or be identical to the serial number of the particular automobile which the code card is to serve. The card 10 also carries a code grid 12 in the form of punched holes, raised indicia or magnetic pattern representing information bits which in the most simple and understandable case may comprise a ten or eleven digit number. A discrete or individual magnetic pattern of wiggly lines, circles and dots may also serve the same purpose of defining a discrete card code for a particular automobile.

The code card is adapted to be inserted into the acceptor slot or opening 13 of a transmitter unit 14. In Figure 4, code card 10 is shown inserted into slot 13 to a position which corresponds to a key ignition 'On' position determined by spring biased step switch member 15 which when in the gap 16 of code card 10 slides on support

member 17 within the transmitter casing or housing 18. Thus a step switch 15a being normally closed when step switch member 15 is in engagement with support member 17 can detect when the code card is inserted in slot 13 to a position at which code detector 19 having detecting elements (not shown) physically arranged to detect only the code of the corresponding code card 10 for the particular automobile is adapted to actuate code generator 20 of Figure 5. However, as a further condition, it is necessary that a second step switch member 21 being normally open when in engagement with shelf support member 17 rides over the thickness of the code card 10 to be thereby actuated to the closed position to close its corresponding step switch 21a, the step switches being connected in series as indicated in Figure 5 and when both closed by the insertion of the code card to the ignition 'On' position shown in Figure 4 actuates carrier generator 22 to generate a radio frequency carrier connecting through a modulator 23 to transmitter 24. Should the code card be removed, the step switch 21a disconnects the carrier signal by disconnecting the carrier generator. The code detector 19 responds only to the code of the particular code card 10 for the particular automobile which it is intended to serve and through line 23 to line 24 activates code generator 20 which latter may generate a modulating signal as, for example, of the amplitude modulation type of, say, a finite number of pulses by way of simple illustration such as, for example, a series of pulses equal to a ten digit number. In the arrangement shown the code generator may simply generate a continuous series of pulses at a very fast rate as, for example, 50 kilocycles mixing in modulator 23 with the carrier signal from line 25 of carrier generator 22, the carrier signal for example may be at 27 megahertz. A counter 26 receives pulses from the carrier generator 20 by way of lines 27, 28 and after counting a discrete number of pulses activates detector carrier

29 to activate a disconnect circuit 30 disconnecting code generator 20 thus defining a discrete number of pulses applied to the carrier signal amplified and emitted by transmitter 24. This is only one rudimentary way of generating a discrete code radio signal embodying a carrier and a code signal but which may be accomplished by amplitude modulation technique, frequency modulation technique or other modulation technique. The particular form of code signal, of course, may be other than a discrete number of pulses counted out as will be evident from pulse code and counting technique of the prior art. In any event the modulating
10 signal is discrete for the particular automobile whereas the carrier is not or need not be.

It is a concept of the invention that either remote from the automobile or within the automobile the code card must always be used in association with the transmitter unit 14 to operate the automobile. Thus the automobile must contain a receiver 31 with which the transmitter unit 14 is adapted to be associated physically within the automobile to engage certain contact terminals 32, 33, 34, 35 thereof with corresponding contact terminals (not shown) of the receiver. Thus as indicated in Figure 3 a dashboard panel 33a of an automobile may carry
20 the usual automobile radio 34a, the ignition receiver 31 and the ignition transmitter 14, the latter having the code card accompanying slot 13. The transmitter unit is removable and transportable exterior of the automobile to enable remote starting of the automobile and also is insertable into the dashboard panel to serve in such location as a code card accompanying unit for starting the automobile and controlling the ignition circuits.

A further function of the code card is to enable depression thereof by the operator from the ignition position to a position depressing

the switch member 35a to actuate the starting switch 36, the latter by line 27 actuating the code generator sending a second counted series of pulses (see counter 36a, decoder 36b and disconnect 36a) by way of mixture with the carrier in modulator 23 to be transmitted by transmitter starter 24 of transmitter unit 14.

In Figure 6 a low current drain solid state carrier detector 38 is designed to be continuously in battery circuit in the automobile. When energized by a carrier signal from transmitter unit 14 it activates receiver 39, the latter then being immediately in condition to demodulate a received modulated carrier. Transmitter switch unit 40 involves the switch and contact terminals 32 to 35 inclusive by means of which the receiving aerial 41 for the carrier detector is disconnected and ten minute timer 42 is disconnected when the transmitter unit 14 is in physical assembly with the receiver unit 31 whereby signal from transmitter circuit 24 connects directly to carrier detector 38 passes through transmitter switch 40 and direct line 43 to carrier line 44 adapted to close the normally open battery circuit 45 represented by leads 46, 47 of Figure 2 connecting between battery plus 48 and chassis ground 49. The battery circuit 45 can only be triggered on by a detection of a correct and discrete code by receiver 39 passing code signal by line 46 to counters 47, 48 and respective decoders 49, 50. The battery circuit channel of counter 47 and decoder 49 is adapted to close the normally open disconnect circuit 51 only upon receiving the particular and discrete code for the automobile corresponding to the code generated by code generator 20 of the transmitter unit 14. When this condition is satisfied the battery circuit becomes operative and carrier signal by line 44 effects closure of the battery circuit passing battery power by line 52 through a delay circuit 53 to battery power distributing

line 54 serving control circuits 55 light circuits 56, heater circuit 57, signal circuits 58 and a washer circuit 59, each having corresponding separate terminals 60, 61, 62, 63, 64, and or other control circuits and terminals for the passive electrical circuitry of the automobile. Notice that the invention contemplates that the source of electrical power for these different passive functions are processed in control circuitry prior to the outlet terminals 60 to 64 of the receiver unit but that from that point on certain switching and or additional control functions may be applied in the automobile circuitry itself. Further it is to be
10 observed that the separate function terminals 60 to 64 of the receiver force a change in the wiring of the conventional automobile so that each of these devices is connected to battery power only through the receiver unit and internal control circuitry so that each separate device must be separately connected. This entails substantial change in the wiring harness of automobile wiring but nevertheless brings about an important and necessary change in the protection afforded against a thief by-passing ignition circuitry in conventional wiring harness. Thus it is desirable to have automatic control circuits of various kinds retained within the receiver unit in advance of the outlet connecting terminals thereof to the
20 utmost degree practical.

A second counter channel comprising counter 48 and decoder 50 is adapted to activate normally open starting circuit 65. However in view of delay device 53 of longer duration than the code being counted the starting circuit will close and open prior to battery voltage being available thereto from delay device 53 and thus the first code pulse will not cause the ignition line 66 to be energised by battery voltage.

If the code card 10 is removed from the transmitter unit at this point the step switch will disconnect the carrier generator so

that repeated insertion and removal of the code card will not activate the normally open starting circuit 65 unless the code card is pressed against the starting switch member 35 to close start switch 36 of transmitter of Figure 5 thus sending a second code again activating both the battery circuit channel and ignition circuit channel, i. e. counters 47 and 48. The battery circuit 45 already having been actuated as described will not be effected by opening of the disconnect circuit 51. Since, however, battery current is available to the distributing line 54 and the starting circuit the latter will immediately pass battery current upon a second (similar) code signal being accepted by counter 48 and decoder 50. Thus the starting circuit line 66 is connected to line 54 to start motor circuit 67, a timing control circuit 68, a carburettor activating circuit 69 and other ignition response control circuits 70 as may be desired and serving separate output terminals of the receiver as at 71, 72, 73, 74.

It is to be understood that the various ignition circuits including the start motor 67 are intended to embody circuitry and functions responsive to engine condition and operation. For example, the start motor circuit 67 will be deactivated by a conventional circuit device (not shown) responsive to the engine catching or starting. Also the timing control circuit may modify the timing of firing of the engine according to conditions of exhaust emission, engine temperature according to engine control techniques of the prior art. The carburettor circuit 69 is responsive to engine temperature, exhaust emission, manifold pressure and the like.

Counter 48 and decoder 50 process a discrete starting code being a repeat of code of generator 20 upon actuation of start switch 36 by the code card 10 but which activates the ignition channel. The

receiver is thus discrete to a degree that a particular automobile accepts only a specific pulse count or code for energising of the starting circuit 65. Starting circuit 65 once conducting embodies a holding circuit feature maintaining battery circuit connection to ignition line 66 until the battery circuit 45 is disconnected by termination of carrier signal in line 44 responsive to removal of the code card 10 from the transmitter.

As seen in Figure 2 the receiver unit 31 may be provided with a plurality of output control terminals 75 (representing terminals 60 to 64 and 67 to 74 of Figure 6) to which a changed automobile harness wiring represented by leads 76 may be connected to utilising devices in the automobile.

It will be evident that a thief in attempting the starting of an automobile with a greatly modified circuitry as required by the devices and system of the invention would encounter great difficulty in obtaining battery power and could only do so by connecting a lead directly from the battery itself to the starting motor then separately to the timing control, then separately to the carburettor control and then to separate ignition circuitry, all of which in such event would be devoid of assistance of automatic operationally responsive circuitry contained in the receiver. Even so, assuming a thief were successful and one must always assume sufficient ingenuity in due course, in such circumstance the code card of the invention is of a form which can be processed by a computer at a licensed registered location thus enabling authorities to prove a code card against a former license plate to permit the issue of a new plate. Thus a stolen automobile cannot survive a period beyond the interval in license issuing. The manufacturers may thus issue a control card with a discrete transmitter receiver for each

automobile enabling a computer processable serial number system to be directly available to a license registration computer equipped authority to control substantially completely, if not wholly eliminate, the substitution of spurious code card transmitter receiver units which might be installed in stolen automobiles of the future. Thus the invention provides a useful deterrent to trade in stolen automobiles.

By way of summary of the operational aspects of the system of the invention, it will be evident that the battery circuit 45 of Figure 6 represents the connection of the battery to the ignition line 54 and starting circuit 65 subject to the performance of two conditions, first the existence of carrier signal on line 44 and second, the detection and processing of a discrete code. In other words, the battery circuit becomes operative to connect the battery responsive to first the carrier code of the code actuator 10 and secondly the actuating code 12 of the code activator 10. Thus the battery circuit functions similar to two electrical switches in series connecting the battery to the ignition line 54 responsive to one of the switches being closed by a carrier code signal and the other of the switches being closed by an actuating code signal, both conditions being necessary. As before mentioned the receiver of the invention includes substantially all of the control circuitry for the various electrical systems of the automobile and presents separate terminals for each of the separate electrical functions. The insertion of the code actuator actuating at least one step switch or equivalent responsive to the physical form of the code actuator itself and/or other code information thereon causes a carrier code signal to be generated for the battery circuit. The carrier code signal is generated when the code actuator is in a predetermined code detecting position for the actuating code 12 thereon. Thus the code detector 19

which may also be referred to as a code sensor herein at the thus determined correct position of the code card effects the generation of a second signal activating the battery circuit causing the latter to be completed providing the carrier code is also activating same. The starting circuit is adapted to transmit battery current from battery circuit 45 when the latter is conducting as a first condition and providing secondly that a starting signal has been initiated by a starting code represented by, for example, depression of the code actuator 10 against the switch abutment 35a of start switch 36 (Figure 4). The code generator 20 of Figure 5 and carrier generator 22 and associated circuitry between the battery circuit 45 and the step switches, code detector and start switch of Figure 5 are represented by radio communication devices in the form of transmitting and receiving devices embodying a carrier generator, a code generator, a receiver and computer components, i.e. counters and decoders associated with each to accomplish by known signal transmitting and receiving technique and discrete codes the closing of the battery circuit responsive to the signals. and codes described and to close the starting circuit responsive to the starting code as set forth.

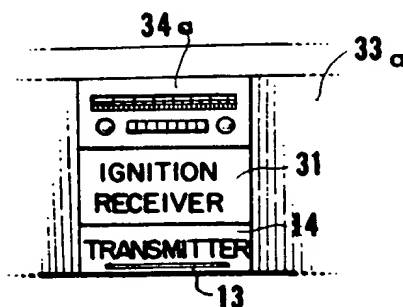
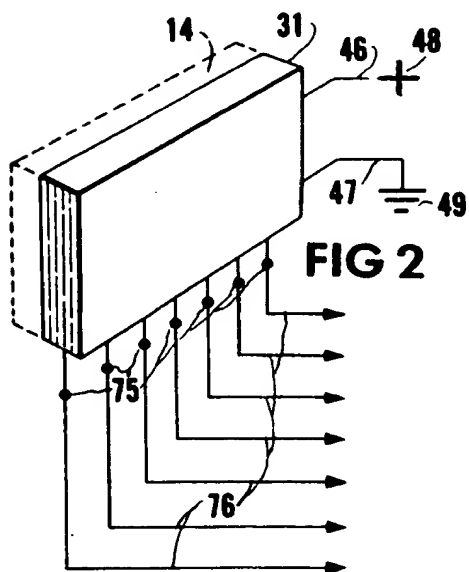
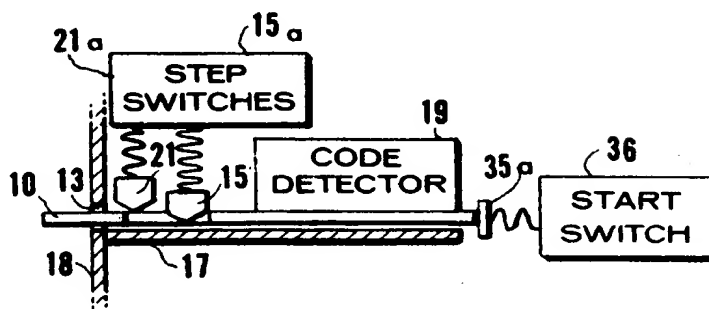
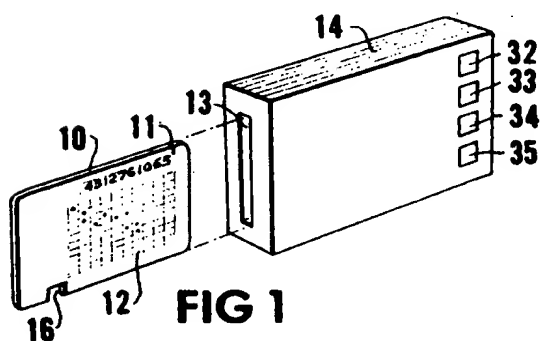
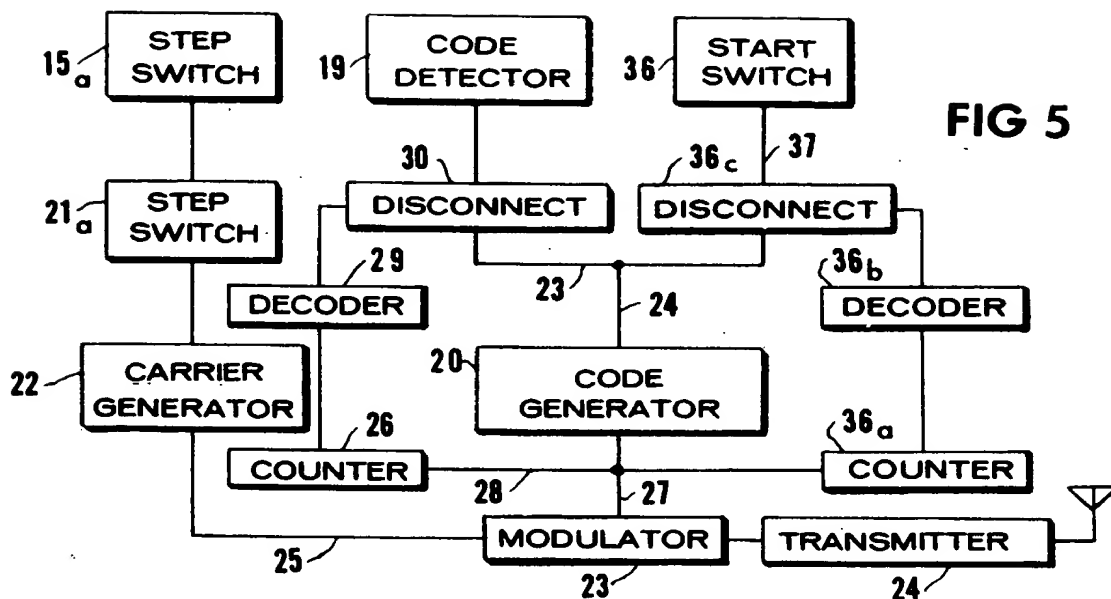
I CLAIM AS MY INVENTION:

1. An anti-theft starting ignition system for automobiles comprising: a code actuator and position index means forming a part thereof; an actuating code on said actuator operative at a predetermined position of said index means, said actuator being manually movable in said system beyond an index position; sensing switch means for sensing the presence of said code actuator in position index position and adapted to generate a carrier signal responsive to said position index means; a sensor for generating a sensing signal responsive to the actuating code of the code actuator when the latter is in an index position; a battery circuit leaving a battery source and active responsive to both said carrier signal and said sensing signal to connect said battery source; an ignition circuit responsive to the connection of said battery source and served thereby; a starting circuit connectable to said ignition circuit responsive to a starting signal; means for generating a starting signal responsive to predetermined manual motion of said code actuator; an enclosure for said battery circuit; ignition circuit and starting circuit; a plurality of outlet terminals on said enclosure each of said terminals serving discrete electric power function.
2. The system of claim 1 and radio communication devices interposed between said battery circuit and said sensing switch means, said sensor and said starting signal generating means.
3. The system of claim 2 in which said radio communication devices embody a transmitter and a receiver; and a carrier signal generator and a discrete code signal generator associated with said transmitter.

4. The system of claim 2 in which said radio communication device embodies a transmitter and a receiver; a carrier signal generator and a code signal generator associated with said transmitter; step switch means activating said carrier generator responsive to a predetermined physical presence of said code actuator in a predetermined position; a code detector operative responsive to a discrete code of said code actuator to actuate said code generator; a counter associated with said code generator adapted to disconnect said code detector from said code generator upon processing of a discrete code by said code detector for the particular automobile; means for modulating the carrier generated by said carrier generator responsive to the action of said code generator activated by said code detector; a transmitter operative responsive to said modulator; a start switch actuable by predetermined motion of said code actuator to activate said code generator and effect transmission of a starting signal by said transmitter subsequent to the transmission thereby of a carrier signal and a code detector signal.

5. The system of claim 1 and a discrete control circuit within said enclosure for each of said terminals.





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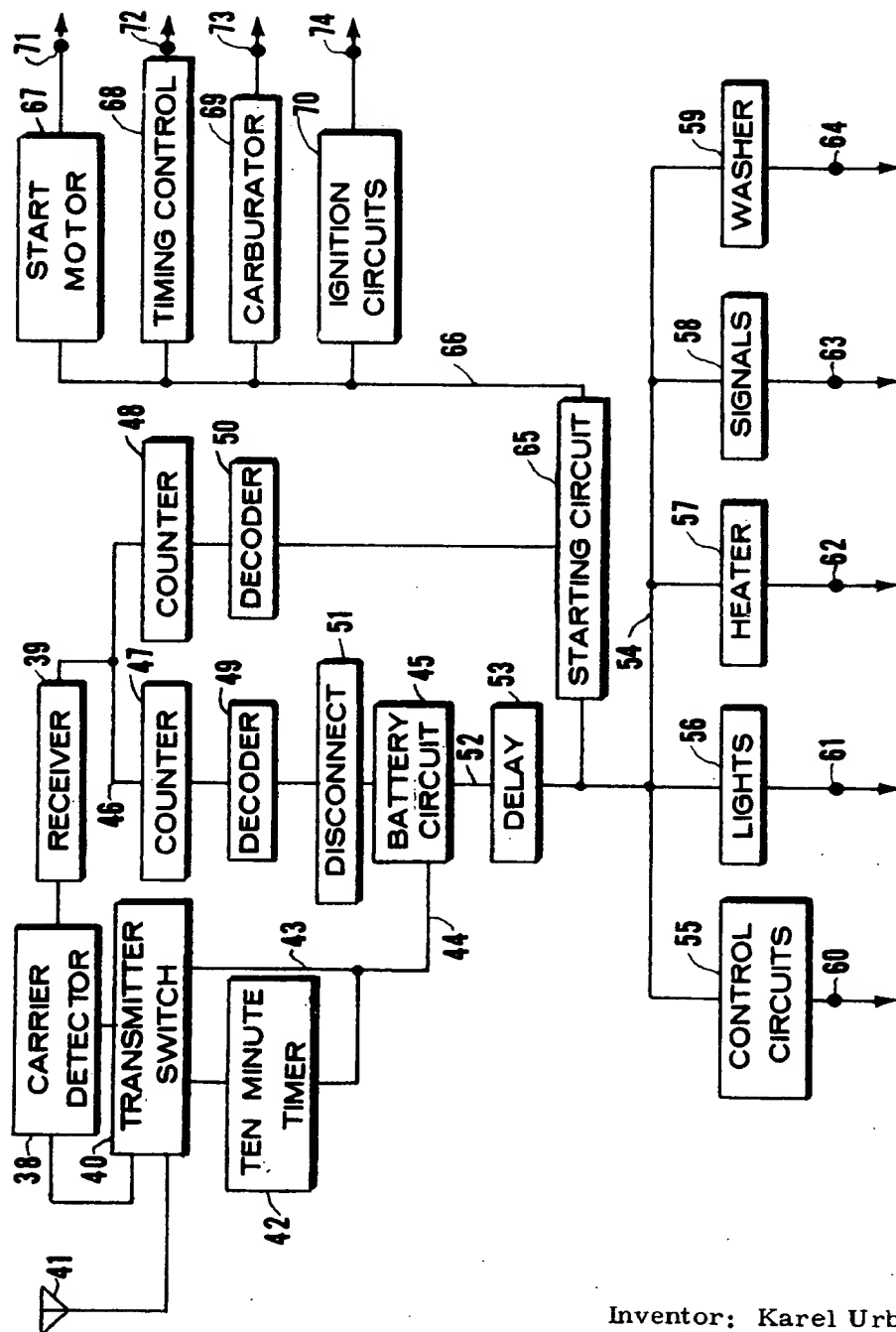


FIG 6

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